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Enzymatic synthesis of polyethylene glycol-400 esters

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Abstract

© 2015 Pleiades Publishing, Ltd. Esters of fatty acids (FAs) and polyethylene glycol-400 (PEG) are valuable chemically derived surfactants. In this work, it is shown that the chemical synthesis of PEG esters can be replaced by enzymatic synthesis under milder conditions and using simpler and more environmentally friendly technology. The main obstacles to enzymatic catalysis in a system of PEG and higher FAs are the high viscosity of the former and the low water solubility of the latter. These problems are solved by selecting organic media and other conditions of the process mediated by pancreatic lipase. The optimum conditions for the synthesis of PEG esters of FAs are determined: reaction medium, benzene/hexane in a ratio of 2: 3; optimum temperature, 25°C; water content in the system, no more than 0.2%; FA: PEG molar ratio, 1: 1.8; reaction time, 48 h. Under these conditions, the yields in synthesizing PEG esters of capric, lauric, and palmitic acids are 80, 78, and 44%, respectively.

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Keywords

biocatalyst in nonaqueous solvents, fatty acids, pancreatic lipase, polyethylene glycol-400